

# Combining analyses on sonic and diamond drilled cores: effect of surface roughness

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## ABSTRACT

In the frame of the EU-H2020 programme on Raw Materials, the SOLSA project on automated on-line-sampling and on-mine analyses obtained a 4-years fund in order to construct a multi-techniques expert system which will integrate for the first time the full chain from sonic drilling combined with XRD-XRF-Raman-IRTF analyses, within an intelligent data architecture and software. SOLSA will provide quantitative reliable data on the chemical, mineralogical and textures of drill cores, essential for geomodeling and decision making for processing. Time and cost-efficiency can be achieved in analysing non-destroyed drill cores in real time. Surface roughnesses, cracks, porosities, dust, humidity and contaminants present major risks for erroneous analyses. For this reason a series of test analyses were performed on samples from sonic and diamond drilled cores representing fine and coarse grained rocks, heterogeneous textures and contrasting mineralogy (sandstone, granite, peridotite, breccia, laterite). We tested the impact of surface roughness on 4 types of surfaces (sonic and diamond drilled convex, cut surfaces, 6  $\mu\text{m}$  and 0.25  $\mu\text{m}$  polished) by comparing spectra from portable Infra-red spectroscopy (SWIR region, large spot size 1.76  $\text{cm}^2$ ), SolXpert combined portable XRF-XRD (10 to 20 min measurement time), and Raman spectroscopy (LabRam HR, 633 nm laser, powers 1.5, 3 and 6 mW at sample surface, spot size 1-2  $\mu\text{m}$ , integration time 20 s and 100 s). Although different spot-sizes, distances to sample surfaces and measurement times were used, rough surfaces gave similar spectrae with all techniques compared to cut or polished ones. SWIR applied on breccias gave dispersed reflectance due to high porosities. For Raman spectroscopy the intensity of luminescence background is stronger for rougher surfaces, but does not influence the phase identification. Sonic drilled surfaces are however of better quality at least for the here tested hardrock samples.

Keywords: Sensor analyses, drill cores, surface effects, Raman spectroscopy, XRD, XRF, infra-red spectroscopy.